THAT CLAIMED IS:

1. A target alignment system for use by a user with a radiation therapy device and a radiation treatment plan for treating a target within a body of a patient and for aligning a position of the target within the body of the patient to a predetermined position used in the development of the radiation treatment plan, comprising:

an ultrasound probe for generating live ultrasound images of the target;

a position sensing system for indicating the position of the ultrasound probe with respect to the radiation therapy device, adapted to provide a reference location of the target with respect to the radiation therapy device;

a computer system including a computer having memory and a monitor with a screen associated therewith, a radiation treatment plan stored in the memory, the computer responsive to the position sensing system and ultrasound probe, and adapted to:

display on the monitor screen the live ultrasound images of the target in association with representations of the radiation treatment plan;

align the displayed representations of the radiation treatment plan with the displayed live ultrasound images in response to a user input;

capture and store at least two two-dimensional ultrasound images of the target overlaid with the aligned representations of the treatment plan data, the ultrasound probe being disposed in a different geometric orientation for each captured ultrasound image; and

determine, in response to the alignment, the difference between the location of the target in the ultrasound images and the location of the target in the representations of the radiation treatment plan.

2. The system of claim 1, wherein the displayed representations of treatment plan data include at least one of an isodose distribution contour and a structure contour.

3. The system of claim 1, wherein the at least two two-dimensional ultrasound images include an axial image and a sagittal image.

4. The system of claim 2, wherein the computer is adapted to display features of the live ultrasound image overlaid with associated dose and structure contour data as the user adjusts the position and angle of the ultrasound probe relative to a patient anatomy.

5. The system of claim 4, wherein the computer is adapted to recalculate dose and structure contour data such that the contours displayed are for a volume slice of radiation treatment plan data that is coincident with a current plane of the live ultrasound image.

6. The system of claim 2, wherein the computer is responsive to the user input and adapted to move a displayed position of the contours relative to the live ultrasound image as part of a user-driven virtual alignment.

7. The system of claim 6, wherein the computer system includes a user input device in the form of a touchscreen, and wherein in response to a user finger drag event, the displayed contours exhibit identical spatial displacements relative to each other.

8. The system of claim 6, wherein the computer is adapted to respond to the user touching a monitor screen display anywhere within boundaries of the live ultrasound image displayed on the monitor screen and dragging a user finger in a desired direction to move the position of the contours relative to the live ultrasound image.

9. The system of claim 7, wherein the computer is further adapted to regenerate displayed contours at periodic intervals such that they appear to track the motion of the user finger.

10. The system of claim 1, wherein the computer is further adapted to display on the monitor screen prior captured and saved two-dimensional ultrasound images of the target defined as reference images, the images overlaid with associated representations of the radiation treatment plan.

11. The system of claim 1, wherein the position sensing system includes the 3-D digitizer articulated arm.

12. The system of claim 1, wherein the computer is further adapted to display an image capture screen having a live ultrasound image window for displaying a live ultrasound image overlaid with position adjustable representations of the radiation treatment plan, the position of the representations of the radiation treatment plan displayed relative to a current plane of the displayed live ultrasound image for performing a user alignment of the displayed representations of the radiation treatment plan with respect to the displayed live ultrasound image, and at least two other static image windows displaying at least two captured two-dimensional ultrasound images of the target overlaid with the corresponding aligned representations of the radiation treatment plan.

13. A method of aligning the position of a target within a body of a patient to a predetermined position used in the development of a radiation treatment plan for the patient, comprising the steps of:

(a) disposing the patient on a treatment table of a radiation therapy device;

(b) providing an ultrasound probe;

(c) manipulating the ultrasound probe to display live ultrasound images of the target, and displaying spatially associated representations of the radiation treatment plan overlaid upon the live ultrasound image;

(d) aligning the displayed representations of the radiation treatment plan with the displayed live ultrasound images;

(e) capturing at least two two-dimensional ultrasound images of the target in the patient's body overlaid with the aligned representations of the radiation treatment plan data, the ultrasound probe being disposed in a different geometric orientation for each captured ultrasound image; and

(f) determining an amount, and type, of movement of at least one of the treatment table, the radiation therapy device, and the patient required to position the target to conform the current position of the target to the position of the target used in the development of the radiation treatment plan.

14. The method of claim 13, wherein the displayed representations of radiation treatment plan includes at least one of an isodose distribution contour and a structure contour.

15. The method of claim 13, wherein the at least two two-dimensional ultrasound images include an axial image and a sagittal image.

16. The method of claim 14, including the step of tracking features of the live ultrasound image overlaid with associated dose and structure contour data as a user adjusts the position and angle of the ultrasound probe relative to a patient anatomy.

17. The method of claim 16, including the step of recalculating dose and structure contour data such that the contours displayed are for the volume slice of the radiation treatment plan that is coincident with the current plane of the live ultrasound image.

18. The method of claim 14, including the step of performing a virtual alignment by moving the contours overlaid on the live ultrasound image device until they are correctly aligned to the patient anatomy as viewed with respect to the live ultrasound image.

19. The method of claim 16, including the step of moving the position of the contours relative to the live ultrasound image as part of a user-driven virtual alignment.

20. The method of claim 18, wherein all displayed contours exhibit identical displacements relative to each other in response to a user finger drag event.

21. The method of claim 14, wherein the step of aligning the displayed representations of the radiation treatment plan is accomplished by touching a monitor screen display anywhere within the boundaries of the live ultrasound image and dragging a finger in a desired direction.

22. The method of claim 20, including the step of regenerating at periodic intervals contours displayed and overlaid upon the live ultrasound image, such that movement of the contours appears to track the motion of the finger.

23. The method of claim 22, wherein the step of regenerating contours includes refreshing the live ultrasound image and associated overlaid contours displayed on the monitor at a rate of at least ten frames per second.

24. The method of claim 13, including the step of mounting the ultrasound probe to a 3-D digitizer articulated arm.

25. The method of claim 13, including repeating steps (c) through (f).